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ABSTRACT

As part of a study of school effectiveness, a procedure was developed to select schools for study based on extreme high or extreme low degrees of successfulness in reading. Data for all 775 public elementary schools in Maryland that were active in 1995 were used. Five triads of schools were selected, each triad consisting of two schools that were high and one school that was low in successfulness. The triads were: (1) high income suburban; (2) moderate income suburban; (3) low income urban; (4) low income suburban; and (5) low income rural. Achievement in schools was measured by the Maryland School Performance Assessment Program. As a first step in selection, regression models were developed to predict reading school means. Then the regression models were used to generate selection indices. Schools were then grouped, first into income levels, and then into levels of urbanicity. The 5 groups from which to select a triad each were then found to be 39 low income urban, 55 low income suburban, 11 low income rural, 28 moderate income suburban, and 78 high income suburban. In each group, schools were ordered on the basis of the selection index. The two highest-scoring and lowest-scoring schools were invited. If a school did not agree to participate, the next-higher or next-lower scoring school was invited until the triad was selected. One appendix, which contains seven tables, discusses the school-level successfulness indices across the state achievement testing program scores, and the other compares test score residuals with the school performance index and its residuals. (Contains six references.) (SLD)

Selection of Higher Successfulness and Lower Successfulness Schools1

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The purpose of this phase of our research was to develop and implement a procedure to select schools based on extreme high or extreme low degrees of successfulness in reading. Five triads of schools were selected, each triad consisting of two schools that were high and one that was low on successfulness. The five triads were: (1) high income suburban, (2) moderate income suburban, (3) low income urban, (3) low income suburban, and (5) low income rural. The data we had available to make these selections was limited to the school-level measures and indicators provided to us by the Maryland State Department of Education.

Schools and Variables

Achievement in schools was measured by the Maryland School Performance Assessment Program (MSPAP). Six content areas are tested in grades 3 and 5 by MSPAP: reading, writing, language arts, mathematics, science, and social studies. Testing typically takes place over the span of a week and involves group and individual activities used to measure applications of knowledge and skills, but the way the domain is organized differs across content areas. Different students complete different activities that make up the scoring events by which the school is assessed. Individual scores on the six content area scales are estimated using item response theory models. The content area scales are equated across years so that comparisons over time are meaningful. For a more detailed overview, see Yen and Ferrara (1997).

Data for all 775 Maryland public elementary schools that were active in 1995 were forwarded to us by the Maryland State Department of Education. The four academic years 1992 through 1995 were included. For each year, variables were included that represented:

- school district
- urbanicity
- enrollment
- attendance
- mobility
- absenteeism
- percent Title I
- percent ESOL
- percent special education
- percent free or reduced price meals
- gender distribution
- ethnic distribution
- number of students in grades 3 and 5
- numbers and percents in grades 3 and 5 taking each MSPAP content area test
- percent satisfactory in grades 3 and 5 on each MSPAP content area test
- scale score mean and st. dev. for grades 3 and 5 on each MSPAP content area test

1 Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL, 3/25/97. Session 12.46: Outlier Study of School Effectiveness: Implications for Public Policy and School Improvement.

Differentiation of Schools by Successfulness

Differentiation of more and less successful schools has been attempted in the past but with mixed results. Rowan, Bossert, and Dwyer (1983) discussed four basic ways to approach this problem. These are: (1) absolute instructional outcome measures such as proportion below grade level, (2) evaluation of trends in grade levels across years, (3) evaluation of trends in cohorts across years such as increases relative to national norms, and (4) residuals from predictions using demographic composition. However, Mandeville and Anderson (1987) characterize approaches in which achievement is regressed onto both socioeconomic status (a component of demographic composition) and prior achievement (Dyer, Linn, and Patton, 1969) as having the most empirical support.

Controlling for prior-year achievement of the same students and socioeconomic status indicators, Mandeville and Anderson (1987) found the overall predictability (squared multiple correlations) of mathematics to be in the range of .34 to .46 and of reading to be in the range of .48 to .76 across grades one to four using school-level data for over 500 South Carolina schools. They then used these equations to find the residuals of the schools and standardized them by their estimated standard errors. The correlations between mathematics and reading residuals ranged from .60 to .70 across the four grades. However, the median cross-grade correlations were only .06 for mathematics and .13 for reading.

Mandeville (1988) further analyzed these data along with the following year's data on the same schools. He evaluated the consistency of the standardized residuals. The correlation between the two years (different students) ranged from .34 to .60 in mathematics and from .36 to .65 in reading across the four grades; a composite sum of the standardized residuals correlated .46 for mathematics and .41 for reading and was judged not to improve stability. The eight correlations between reading and math that held year in common (same students) ranged from .59 to .74. There were six correlations between pairs of the four grades each year, yielding 12 cross-grade correlations for each subject matter area. These cross-grade correlations ranged from .00 to .19 in mathematics and from -.02 to .18 in reading. In reviewing these two sets of data, Mandeville (1988) suggested that teacher cohorts instead of schools should be the focus of studies of successfulness.

The need for student-based data to be included in a regression-based procedure for differentiation of schools on successfulness was considered by Mandeville (1988), who concluded that his basic findings would change little. However, Webster, Mendro, Bembry, and Orsak (1995) described a study that compared ranking procedures using student-based data with school-level data only and found different rankings. Webster, Mendro, Bembry, and Orsak (1995) also calculated ranks according to several different algorithms using student-level data and found them to be almost interchangeable.

Method

Based on available data and informed by the studies reviewed, our selection of the five triads of schools was accomplished in several steps. Appendices A and B explore these steps for content areas other than reading.

1. We developed regression models to predict Reading school means.

PROCESS: Using weighted regression, weighting by the inverse variance of error of the mean, we predicted 199X mean MSPAP reading score at each school at each grade level (third and fifth) using as predictors:

elementary enrollment
elementary attendance rate
percent entrants
percent withdrawls
percent absent less than five days
percent absent more than twenty days
percent special education
percent free or reduced price meals
percent Indian (American or Alaskan Native)
percent Asian or Pacific Islander
percent African American
percent Hispanic
percent accounted for on the 199X MSPAP reading assessment

We then repeated the regressions adding 199(X-1) mean MSPAP reading score at that grade level. This was done in order to have a measure that could tap gains in reading performance along with the previous measure that evaluates absolute performance in relation to the demographic variables.

RESULT: Four regression models for each of three years were developed (third & fifth with & without prior mean reading score), 1995, 1994, 1993.

EVALUATION: The multiple R-Square values for each of the twelve regressions were:

1995 Grade Three,	Without	Prior Reading Score:	.73
1995 Grade Three,	With	Prior Reading Score:	.80
1995 Grade Five,	Without	Prior Reading Score:	.73
1995 Grade Five,	With	Prior Reading Score:	.79
1994 Grade Three,	Without	Prior Reading Score:	.76
1994 Grade Three,	With	Prior Reading Score:	.82
1994 Grade Five,	Without	Prior Reading Score:	.74
1994 Grade Five,	With	Prior Reading Score:	.80
1993 Grade Three,	Without	Prior Reading Score:	.78
1993 Grade Three,	With	Prior Reading Score:	.84
1993 Grade Five,	Without	Prior Reading Score:	.71
1993 Grade Five,	With	Prior Reading Score:	.79

The values for grade three with prior reading range from .80 to .84 and are most directly comparable to Mandeville's (1988) squared multiple correlations of .64 to .65 for grade three with percent free or reduced lunch and prior year reading score as predictors. The greater predictability we found may be due to the increased number of predictors we used and/or to our use of weighted regression. On the other hand, Mandeville's (1988) use of prior test score from the previous year on the same students should lead to a

higher correlation since our data on prior year were for an independent group of students.

2. We used the regression models to generate selection indices.

PROCESS: We calculated "studentized" residuals from each of the twelve regression models. (Studentized residuals are standardized by the estimates of their individual standard errors.) We then created a selection index at each of the three years by combining the four studentized residuals for grades three and five. They were unweighted in the sum since we wanted to reflect absolute success levels and change in level of success about equally in selecting schools. Then, we computed a final selection index by summing the selection indices, weighting each subsequent year twice the previous year. Although Mandeville's (1988) results suggested that we would not improve stability of this index very much if at all, we nevertheless wanted to reflect consistency in our selection index, but at the same time emphasize more recent data.

In the table below, the raw residuals are labeled:

1995 Grade Three, Without Prior Reading Score: RDABL395
1995 Grade Three, With Prior Reading Score: RDCHA395
1995 Grade Five, Without Prior Reading Score: RDABL595
1995 Grade Five, With Prior Reading Score: RDCHA595

1995 Grade Three, Without Prior Reading Score: RDABL394
1995 Grade Three, With Prior Reading Score: RDCHA394
1995 Grade Five, Without Prior Reading Score: RDABL594
1995 Grade Five, With Prior Reading Score: RDCHA594

1995 Grade Three, Without Prior Reading Score: RDABL393
1995 Grade Three, With Prior Reading Score: RDCHA393
1995 Grade Five, Without Prior Reading Score: RDABL593
1995 Grade Five, With Prior Reading Score: RDCHA593

and the selection indices are:

RDABL395 + RDCHA395 + RDABL595 + RDCHA595 = SELECT95
RDABL394 + RDCHA394 + RDABL594 + RDCHA594 = SELECT94
RDABL393 + RDCHA393 + RDABL593 + RDCHA593 = SELECT93

and the final selection index is:

SELECT93 + 2*SELECT94 + 4*SELECT95 = SELECT

RESULT: This selection index was used to choose outlier schools based on MSPAP reading performance. A high positive number indicated a high-scoring school and a low negative number indicated a low-scoring school. The selection index was scaled by dividing by a constant 7 for ease of interpretation.

EVALUATION: Following are means, standard deviations, and correlations among all these variables.

Variable	Cases	Mean	Std Dev
RDABL393	688	-.1434	1.4306
RDCHA393	678	-.1470	1.7353
RDABL593	645	-.1678	1.4950
RDCHA593	638	-.1190	1.5415
RDABL394	660	-.1343	1.2396
RDCHA394	649	-.1009	1.4805
RDABL594	651	-.1040	1.6332
RDCHA594	641	-.0559	1.9201
RDABL395	643	-.0048	1.4505
RDCHA395	676	-.0487	1.3030
RDABL595	642	-.0609	1.4576
RDCHA595	643	-.1181	1.4024
SELECT93	632	-.4578	3.6768
SELECT94	619	-.4672	4.1204
SELECT95	625	-.1198	3.6438
SELECT	551	-.2438	2.5849

- - Correlation Coefficients - -

	RDABL393	RDCHA393	RDABL593	RDCHA593	RDABL394	RDCHA394
RDABL393	1.0000	.8391	.4344	.2308	.4456	.0434
	(688)	(678)	(641)	(634)	(632)	(622)
	P= .	P= .000	P= .000	P= .000	P= .000	P= .280
RDCHA393	.8391	1.0000	.3431	.2081	.2815	-.0479
	(678)	(678)	(639)	(632)	(628)	(618)
	P= .000	P= .	P= .000	P= .000	P= .000	P= .235
RDABL593	.4344	.3431	1.0000	.8646	.2427	.0928
	(641)	(639)	(645)	(638)	(605)	(596)
	P= .000	P= .000	P= .	P= .000	P= .000	P= .024
RDCHA593	.2308	.2081	.8646	1.0000	.1471	.0985
	(634)	(632)	(638)	(638)	(600)	(592)
	P= .000	P= .000	P= .000	P= .	P= .000	P= .017
RDABL394	.4456	.2815	.2427	.1471	1.0000	.7987
	(632)	(628)	(605)	(600)	(660)	(649)
	P= .000	P= .000	P= .000	P= .000	P= .	P= .000
RDCHA394	.0434	-.0479	.0928	.0985	.7987	1.0000
	(622)	(618)	(596)	(592)	(649)	(649)
	P= .280	P= .235	P= .024	P= .017	P= .000	P= .
RDABL594	.2413	.1362	.2916	.1758	.3923	.2168
	(623)	(617)	(613)	(608)	(632)	(623)
	P= .000	P= .001	P= .000	P= .000	P= .000	P= .000
RDCHA594	.0877	-.0717	-.1476	-.2089	.1965	.1333
	(614)	(609)	(606)	(601)	(628)	(619)
	P= .030	P= .077	P= .000	P= .000	P= .000	P= .001
RDABL395	.3049	.1640	.1908	.1053	.4252	.2500
	(618)	(614)	(610)	(606)	(606)	(598)
	P= .000	P= .000	P= .000	P= .009	P= .000	P= .000
RDCHA395	.1127	.0922	.0589	.0286	-.0919	-.1576
	(647)	(641)	(615)	(612)	(630)	(623)
	P= .004	P= .019	P= .145	P= .479	P= .021	P= .000
RDABL595	.2845	.1896	.3098	.1805	.1622	.0536
	(615)	(611)	(608)	(602)	(605)	(598)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .190
RDCHA595	.2414	.2086	.2160	.0856	.0815	.0108
	(615)	(611)	(609)	(603)	(605)	(598)
	P= .000	P= .000	P= .000	P= .036	P= .045	P= .792
SELECT93	.7669	.7187	.8529	.7742	.3609	.0699
	(632)	(632)	(632)	(632)	(597)	(589)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .090
SELECT94	.2489	.0243	.1263	.0388	.7496	.6915
	(595)	(592)	(590)	(586)	(619)	(619)
	P= .000	P= .555	P= .002	P= .348	P= .000	P= .000
SELECT95	.3273	.2027	.2947	.1735	.2599	.0825
	(600)	(596)	(592)	(589)	(590)	(583)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .047
SELECT	.5136	.3469	.4950	.3309	.5477	.3259
	(551)	(551)	(551)	(551)	(551)	(551)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000

	RDABL594	RDCHA594	RDABL395	RDCHA395	RDABL595	RDCHA595
RDABL393	.2413	.0877	.3049	.1127	.2845	.2414
	(623)	(614)	(618)	(647)	(615)	(615)
	P= .000	P= .030	P= .000	P= .004	P= .000	P= .000
RDCHA393	.1362	-.0717	.1640	.0922	.1896	.2086
	(617)	(609)	(614)	(641)	(611)	(611)
	P= .001	P= .077	P= .000	P= .019	P= .000	P= .000
RDABL593	.2916	-.1476	.1908	.0589	.3098	.2160
	(613)	(606)	(610)	(615)	(608)	(609)
	P= .000	P= .000	P= .000	P= .145	P= .000	P= .000
RDCHA593	.1758	-.2089	.1053	.0286	.1805	.0856
	(608)	(601)	(606)	(612)	(602)	(603)
	P= .000	P= .000	P= .009	P= .479	P= .000	P= .036
RDABL394	.3923	.1965	.4252	-.0919	.1622	.0815
	(632)	(628)	(606)	(630)	(605)	(605)
	P= .000	P= .000	P= .000	P= .021	P= .000	P= .045
RDCHA394	.2168	.1333	.2500	-.1576	.0536	.0108
	(623)	(619)	(598)	(623)	(598)	(598)
	P= .000	P= .001	P= .000	P= .000	P= .190	P= .792
RDABL594	1.0000	.7826	.2904	-.0308	.3603	.0688
	(651)	(641)	(613)	(622)	(613)	(612)
	P= .	P= .000	P= .000	P= .443	P= .000	P= .089
RDCHA594	.7826	1.0000	.2997	.1496	.1194	-.0363
	(641)	(641)	(607)	(614)	(607)	(606)
	P= .000	P= .	P= .000	P= .000	P= .003	P= .372
RDABL395	.2904	.2997	1.0000	.8034	.3477	.2813
	(613)	(607)	(643)	(638)	(633)	(630)
	P= .000	P= .000	P= .	P= .000	P= .000	P= .000
RDCHA395	-.0308	.1496	.8034	1.0000	.2481	.2741
	(622)	(614)	(638)	(676)	(632)	(633)
	P= .443	P= .000	P= .000	P= .	P= .000	P= .000
RDABL595	.3603	.1194	.3477	.2481	1.0000	.8722
	(613)	(607)	(633)	(632)	(642)	(638)
	P= .000	P= .003	P= .000	P= .000	P= .	P= .000
RDCHA595	.0688	-.0363	.2813	.2741	.8722	1.0000
	(612)	(606)	(630)	(633)	(638)	(643)
	P= .089	P= .372	P= .000	P= .000	P= .000	P= .
SELECT93	.2661	-.1325	.2750	.1197	.2875	.2067
	(604)	(597)	(603)	(607)	(598)	(598)
	P= .000	P= .001	P= .000	P= .003	P= .000	P= .000
SELECT94	.7981	.7464	.4293	.0499	.2366	.0528
	(619)	(619)	(591)	(596)	(591)	(590)
	P= .000	P= .000	P= .000	P= .224	P= .000	P= .200
SELECT95	.2910	.1447	.7796	.7625	.8073	.7677
	(598)	(593)	(625)	(625)	(625)	(625)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
SELECT	.5833	.4097	.8205	.6287	.8374	.6442
	(551)	(551)	(551)	(551)	(551)	(551)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000

	SELECT93	SELECT94	SELECT95	SELECT
RDABL393	.7669	.2489	.3273	.5136
	(632)	(595)	(600)	(551)
	P= .000	P= .000	P= .000	P= .000
RDCHA393	.7187	.0243	.2027	.3469
	(632)	(592)	(596)	(551)
	P= .000	P= .555	P= .000	P= .000
RDABL593	.8529	.1263	.2947	.4950
	(632)	(590)	(592)	(551)
	P= .000	P= .002	P= .000	P= .000
RDCHA593	.7742	.0388	.1735	.3309
	(632)	(586)	(589)	(551)
	P= .000	P= .348	P= .000	P= .000
RDABL394	.3609	.7496	.2599	.5477
	(597)	(619)	(590)	(551)
	P= .000	P= .000	P= .000	P= .000
RDCHA394	.0699	.6915	.0825	.3259
	(589)	(619)	(583)	(551)
	P= .090	P= .000	P= .047	P= .000
RDABL594	.2661	.7981	.2910	.5833
	(604)	(619)	(598)	(551)
	P= .000	P= .000	P= .000	P= .000
RDCHA594	-.1325	.7464	.1447	.4097
	(597)	(619)	(593)	(551)
	P= .001	P= .000	P= .000	P= .000
RDABL395	.2750	.4293	.7796	.8205
	(603)	(591)	(625)	(551)
	P= .000	P= .000	P= .000	P= .000
RDCHA395	.1197	.0499	.7625	.6287
	(607)	(596)	(625)	(551)
	P= .003	P= .224	P= .000	P= .000
RDABL595	.2875	.2366	.8073	.8374
	(598)	(591)	(625)	(551)
	P= .000	P= .000	P= .000	P= .000
RDCHA595	.2067	.0528	.7677	.6442
	(598)	(590)	(625)	(551)
	P= .000	P= .200	P= .000	P= .000
SELECT93	1.0000	.1389	.3327	.5342
	(632)	(583)	(586)	(551)
	P= .	P= .001	P= .000	P= .000
SELECT94	.1389	1.0000	.2499	.5966
	(583)	(619)	(577)	(551)
	P= .001	P= .	P= .000	P= .000
SELECT95	.3327	.2499	1.0000	.9064
	(586)	(577)	(625)	(551)
	P= .000	P= .000	P= .	P= .000
SELECT	.5342	.5966	.9064	1.0000
	(551)	(551)	(551)	(551)
	P= .000	P= .000	P= .000	P= .

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

3. We then grouped schools into income levels.

PROCESS: Using the variable Percent Eligible for Free or Reduced Price Meals, the schools were grouped into quintiles, low to high. The lowest 20% were categorized as high-income, the third 20% as moderate income, and the highest 20% as low income. Thus, the quintiles were treated as:

First 20 Percent:	High Income
Second 20 Percent:	Ignored
Third 20 Percent:	Moderate Income
Fourth 20 Percent:	Ignored
Fifth 20 Percent:	Low Income

4. The schools were next grouped into urbanicity levels.

PROCESS: Using National Center for Education Statistics locale codes, we grouped schools into urban, suburban, or rural. The table below shows how the grouping was done and the frequencies of schools in each of the groups.

Code 1 (Large City):	Urban	N=55
Code 2 (Mid-Size City):	Ignore	N=17
Code 3 (Urban Fringe of a Large City):	Suburban	N=336
Code 4 (Urban Fringe of a Mid-Size City):	Ignore	N=13
Code 5 (Large Town):	Ignore	N=4
Code 6 (Small Town):	Rural	N=41
Code 7 (Rural):	Rural	N=85

5. We then identified five groups from which to select one triad of schools, each:

Low Income	and Urban	N=39
Low Income	and Suburban	N=55
Low Income	and Rural	N=11
Moderate Income	and Suburban	N=28
High Income	and Suburban	N=78

6. We then selected schools.

PROCESS: In each group, we ordered the schools on the basis of the selection index. The two highest-scoring schools and the lowest-scoring school were invited to participate. In case a school did not agree, the next-higher scoring school or the next-lower scoring school were used as back-ups until the triad for that group was selected. These selections were discussed with Maryland State Department of Education personnel to find out if any concerns existed that should argue against selection any of these particular schools for study. Although several of the schools had already been singled out in one way or another, it was decided not to allow that to influence the choice of field study sites. Thus, no school was dropped from the study for reasons external to the selection process just described.

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Appendix A

School-Level Successfulness Indices Across Maryland School Performance Assessment Program Content Area Scores

We applied analyses similar to those done on reading to the other five MSPAP content area scores. Besides these analyses, we also looked at regressions using the prior year mean as an additional predictor (as we did with reading) as well as, for fifth grade, using the two-year-ago mean for third grade (since there should be substantial overlap in students). Neither of these indices showed much stability over years and so we abandoned further modeling using prior achievement as a predictor. These analyses are available upon request.

Purpose: To compare residual variation on school-level MSPAP content area scores for the six content area variables and composites across years.

Sample: All Maryland elementary schools in 1993, 1994, and 1995.

Method: Using weighted regression, weighting by the inverse variance of error of the mean, grade 3 and 5 school outcome means for each content area test score at each year were predicted from:

elementary enrollment for that year
elementary attendance rate for that year
percent entrants for that year
percent withdrawals for that year
percent absent less than five days for that year
percent absent more than twenty days for that year
percent special education for that year
percent free or reduced price means for that year
percent Indian (American or Alaskan Native) for that year
percent Asian or Pacific Islander for that year
percent African American for that year
percent Hispanic for that year
percent accounted for on that year's MSPAP test for that content area at that grade level

This resulted in 36 regressions (6 content areas by 2 grades by 3 years). The studentized residuals from each equation were retained for further analyses. Composite variables were created as sums of residuals across grades and content areas. Numbers of school ranged from 605 to 711 across the regressions.

Results: Tables 1-6 show the intercorrelations among the residuals for each content area separately. The first four characters in each variable name identify the content area, the next (fifth) character identifies the grade level, and the next two (sixth and seventh) identify the year.

Stability of residuals over grades is a methodological precondition to interpreting them as indices of higher or lower successfulness for schools. If they are specific to grades within schools but not stable across grades, then teacher cohorts would dominate school comparisons as Mandeville (1988) has found. Accordingly, Tables 1-6 were evaluated for grade stability.

For Language, the correlations between grades 3 and 5 were:
1993: .36 1994: .21 1995: .42

For Reading, the correlations between grades 3 and 5 were:
1993: .43 1994: .39 1995: .33

For Writing, the correlations between grades 3 and 5 were:
1993: .37 1994: .46 1995: .44

For Social Studies, the correlations between grades 3 and 5 were:
1993: .50 1994: .40 1995: .37

For Science, the correlations between grades 3 and 5 were:
1993: .45 1994: .48 1995: .44

For Math, the correlations between grades 3 and 5 were:
1993: .38 1994: .35 1995: .55

These results suggest moderate stability between the third and fifth grade residuals for each content area. It seems appropriate to aggregate residuals across schools to assess successfulness.

The content area residuals were then averaged for each school to form a content area composite. Table 7 shows the intercorrelations among these 6 composites for the 3 years (18 variables). The correlations among these composites are substantial and in all cases statistically greater than zero.

These composites were then averaged across content areas for each school separately for Verbal (Language, Reading, Writing, Social Studies) and Quantitative (Science, Math) subject matter areas. An average of these two scores was also created (called SEL). Table 8 shows the intercorrelations among these composites.

The correlations between Verbal and Quantitative areas were:
1993: .85 1994: .86 1995: .88

These correlations suggest that it is reasonable to combine the verbal and quantitative composites and form a composite for each school by averaging across the six content areas across the two grade levels. The SEL index is that composite.

Intercorrelations among the SEL index across the three years ranged from .57 to .68. This suggests that the index is relatively stable, tending to rank schools similarly on a year-to-year basis.

Conclusions

The residuals appear reasonably stable across years. Not surprisingly, there do seem to be cohort effects, such that the correlations across content areas for the same year tend to be greater than for different years.

The content areas do not seem to separate into groups according to patterns of intercorrelations, which led us to combine all six into a

composite index (called SEL). The stability of the composite is probably due to one or both of two factors: (1) characteristics of school populations unmeasured (or not adequately measured) by the set of predictor variables, and (2) consistency of school effects. Examples of the former might be community-based programs, land uses, access to libraries, degree of crime, or transportation patterns. Examples of the latter might be educational backgrounds of the teachers, style of the principal, expenditure of resources, familiarity with MSPAP, or general school attitudes.

Table 1. Intercorrelations of School Residuals on MSPAP Language Content Scores

Variable	Cases	Mean	Std Dev
LANG3930	665	.2137	1.3049
LANG5930	608	.0416	1.2320
LANG3940	676	.1060	1.1942
LANG5940	594	.0073	1.5952
LANG3950	697	.0578	1.3572
LANG5950	605	.0426	1.2901

- - Correlation Coefficients - -

	LANG3930	LANG5930	LANG3940	LANG5940	LANG3950	LANG5950
LANG3930	1.0000	.3635**	.4283**	.3555**	.4323**	.3839**
LANG5930	.3635**	1.0000	.2531**	.4465**	.2700**	.2965**
LANG3940	.4283**	.2531**	1.0000	.2137**	.4285**	.2066**
LANG5940	.3555**	.4465**	.2137**	1.0000	.1775**	.4807**
LANG3950	.4323**	.2700**	.4285**	.1775**	1.0000	.4194**
LANG5950	.3839**	.2965**	.2066**	.4807**	.4194**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed
Fourth character in variable name is grade; next two are year.

Table 2. Intercorrelations of School Residuals on MSPAP Reading Content Scores

Variable	Cases	Mean	Std Dev
READ3930	688	-.1434	1.4306
READ5930	645	-.1678	1.4950
READ3940	660	-.1343	1.2396
READ5940	651	-.1040	1.6332
READ3950	683	-.0752	1.2033
READ5950	651	-.1259	1.4962

- - Correlation Coefficients - -

	READ3930	READ5930	READ3940	READ5940	READ3950	READ5950
READ3930	1.0000	.4344**	.4456**	.2413**	.3156**	.2814**
READ5930	.4344**	1.0000	.2427**	.2916**	.1829**	.3203**
READ3940	.4456**	.2427**	1.0000	.3923**	.4218**	.1277**
READ5940	.2413**	.2916**	.3923**	1.0000	.1291**	.3283**
READ3950	.3156**	.1829**	.4218**	.1291**	1.0000	.3347**
READ5950	.2814**	.3203**	.1277**	.3283**	.3347**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed
Fourth character in variable name is grade; next two are year.

Table 3. Intercorrelations of School Residuals on MSPAP Writing Content Scores

Variable	Cases	Mean	Std Dev
WRIT3930	678	.1188	1.1089
WRIT5930	626	.0773	1.3126
WRIT3940	695	.1082	1.1639
WRIT5940	671	.0675	1.2043
WRIT3950	689	.0643	1.2714
WRIT5950	626	.1465	1.2635

- - Correlation Coefficients - -

	WRIT3930	WRIT5930	WRIT3940	WRIT5940	WRIT3950	WRIT5950
WRIT3930	1.0000	.3868**	.4768**	.4004**	.3687**	.3334**
WRIT5930	.3868**	1.0000	.2631**	.3554**	.2797**	.2175**
WRIT3940	.4768**	.2631**	1.0000	.4618**	.3632**	.2964**
WRIT5940	.4004**	.3554**	.4618**	1.0000	.3465**	.4881**
WRIT3950	.3687**	.2797**	.3632**	.3465**	1.0000	.4380**
WRIT5950	.3334**	.2175**	.2964**	.4881**	.4380**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed
Fourth character in variable name is grade; next two are year.

Table 4. Intercorrelations of School Residuals on MSPAP Social Studies Content Scores

Variable	Cases	Mean	Std Dev
SOCS3930	711	-.1202	1.2855
SOCS5930	641	-.0906	1.1859
SOCS3940	707	-.2122	1.3195
SOCS5940	663	-.1607	1.3888
SOCS3950	710	-.1052	1.8408
SOCS5950	637	-.1906	2.0603

- - Correlation Coefficients - -

	SOCS3930	SOCS5930	SOCS3940	SOCS5940	SOCS3950	SOCS5950
SOCS3930	1.0000	.4958**	.4991**	.3012**	.4068**	.3002**
SOCS5930	.4958**	1.0000	.3575**	.3401**	.2633**	.2190**
SOCS3940	.4991**	.3575**	1.0000	.3951**	.3587**	.2447**
SOCS5940	.3012**	.3401**	.3951**	1.0000	.2178**	.4079**
SOCS3950	.4068**	.2633**	.3587**	.2178**	1.0000	.3664**
SOCS5950	.3002**	.2190**	.2447**	.4079**	.3664**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed
Fourth character in variable name is grade; next two are year.

Table 5. Intercorrelations of School Residuals on MSPAP Science Content Scores

Variable	Cases	Mean	Std Dev
SCIN3930	700	-.1796	1.7239
SCIN5930	648	-.0999	1.3121
SCIN3940	698	-.1316	1.2232
SCIN5940	655	-.0592	1.3880
SCIN3950	700	-.1254	1.6803
SCIN5950	626	-.0869	1.5213

- - Correlation Coefficients - -

	SCIN3930	SCIN5930	SCIN3940	SCIN5940	SCIN3950	SCIN5950
SCIN3930	1.0000	.4514**	.4130**	.2286**	.2142**	.3565**
SCIN5930	.4514**	1.0000	.3176**	.4271**	.2242**	.2612**
SCIN3940	.4130**	.3176**	1.0000	.4789**	.3860**	.3651**
SCIN5940	.2286**	.4271**	.4789**	1.0000	.2989**	.4641**
SCIN3950	.2142**	.2242**	.3860**	.2989**	1.0000	.4368**
SCIN5950	.3565**	.2612**	.3651**	.4641**	.4368**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed
Fourth character in variable name is grade; next two are year.

Table 6. Intercorrelations of School Residuals on MSPAP Math Content Scores

Variable	Cases	Mean	Std Dev
MATH3930	683	-.3220	2.6661
MATH5930	678	-.0483	1.1200
MATH3940	679	-.1877	1.7891
MATH5940	668	-.1144	1.4897
MATH3950	677	-.1697	1.4019
MATH5950	630	-.0428	1.3094

- - Correlation Coefficients - -

	MATH3930	MATH5930	MATH3940	MATH5940	MATH3950	MATH5950
MATH3930	1.0000	.3832**	.3132**	.2131**	.2580**	.1842**
MATH5930	.3832**	1.0000	.3203**	.4313**	.3179**	.3924**
MATH3940	.3132**	.3203**	1.0000	.3463**	.3959**	.2712**
MATH5940	.2131**	.4313**	.3463**	1.0000	.2675**	.4535**
MATH3950	.2580**	.3179**	.3959**	.2675**	1.0000	.5536**
MATH5950	.1842**	.3924**	.2712**	.4535**	.5536**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed
Fourth character in variable name is grade; next two are year.

Table 7. Intercorrelations of Sums of School Residuals Across Third and Fifth Grades on MSPAP Content Scores

Variable	Cases	Mean	Std Dev
LANG93	605	.1152	.9877
LANG94	591	.0493	1.0076
LANG95	604	.0497	.9551
READ93	641	-.1549	1.0724
READ94	632	-.1242	.9948
READ95	644	-.1034	1.0457
WRIT93	624	.0898	.9704
WRIT94	666	.0832	1.0008
WRIT95	624	.1164	.9674
SOCS93	640	-.1278	.9646
SOCS94	660	-.1712	1.0504
SOCS95	635	-.1648	1.3232
SCIN93	645	-.1569	1.0978
SCIN94	651	-.0831	1.0831
SCIN95	624	-.0857	1.1208
MATH93	657	-.1987	1.6211
MATH94	652	-.1163	1.2207
MATH95	624	-.1043	1.0712

Last two characters in variable name are year.

Correlations are on the next page.

	LANG93	LANG94	LANG95	READ93	READ94	READ95
LANG93	1.0000	.5962**	.5136**	.6180**	.4606**	.3513**
LANG94	.5962**	1.0000	.5661**	.4904**	.5847**	.4829**
LANG95	.5136**	.5661**	1.0000	.3813**	.4607**	.7624**
READ93	.6180**	.4904**	.3813**	1.0000	.4964**	.4037**
READ94	.4606**	.5847**	.4607**	.4964**	1.0000	.5041**
READ95	.3513**	.4829**	.7624**	.4037**	.5041**	1.0000
WRIT93	.8210**	.5685**	.5033**	.6866**	.4594**	.3699**
WRIT94	.4818**	.6715**	.4499**	.3777**	.7299**	.4485**
WRIT95	.4929**	.5782**	.8342**	.4168**	.5032**	.7501**
SOCS93	.6844**	.5234**	.4649**	.8806**	.5403**	.4124**
SOCS94	.4329**	.6396**	.4921**	.4554**	.8450**	.5140**
SOCS95	.3397**	.4591**	.6655**	.4128**	.4130**	.8121**
SCIN93	.6260**	.5047**	.4201**	.8175**	.5322**	.3788**
SCIN94	.4169**	.5956**	.4595**	.4288**	.8150**	.5125**
SCIN95	.3427**	.5024**	.7208**	.4385**	.4723**	.8585**
MATH93	.5666**	.4518**	.2736**	.6096**	.5011**	.2600**
MATH94	.3531**	.5862**	.3936**	.3698**	.7677**	.4386**
MATH95	.3334**	.4459**	.6575**	.4454**	.4722**	.7952**

	WRIT93	WRIT94	WRIT95	SOCS93	SOCS94	SOCS95
LANG93	.8210**	.4818**	.4929**	.6844**	.4329**	.3397**
LANG94	.5685**	.6715**	.5782**	.5234**	.6396**	.4591**
LANG95	.5033**	.4499**	.8342**	.4649**	.4921**	.6655**
READ93	.6866**	.3777**	.4168**	.8806**	.4554**	.4128**
READ94	.4594**	.7299**	.5032**	.5403**	.8450**	.4130**
READ95	.3699**	.4485**	.7501**	.4124**	.5140**	.8121**
WRIT93	1.0000	.5298**	.4415**	.7276**	.4192**	.3474**
WRIT94	.5298**	1.0000	.5360**	.4853**	.7266**	.4178**
WRIT95	.4415**	.5360**	1.0000	.4564**	.4962**	.6772**
SOCS93	.7276**	.4853**	.4564**	1.0000	.5074**	.4070**
SOCS94	.4192**	.7266**	.4962**	.5074**	1.0000	.5135**
SOCS95	.3474**	.4178**	.6772**	.4070**	.5135**	1.0000
SCIN93	.6962**	.4478**	.4494**	.8642**	.4901**	.4180**
SCIN94	.4007**	.7007**	.5251**	.5095**	.8713**	.4821**
SCIN95	.3805**	.4366**	.7637**	.4659**	.5419**	.9118**
MATH93	.5908**	.4138**	.2944**	.6073**	.4997**	.2962**
MATH94	.3694**	.5759**	.3793**	.4400**	.7318**	.4486**
MATH95	.3417**	.4315**	.6882**	.4574**	.5769**	.9038**

	SCIN93	SCIN94	SCIN95	MATH93	MATH94	MATH95
LANG93	.6260**	.4169**	.3427**	.5666**	.3531**	.3334**
LANG94	.5047**	.5956**	.5024**	.4518**	.5862**	.4459**
LANG95	.4201**	.4595**	.7208**	.2736**	.3936**	.6575**
READ93	.8175**	.4288**	.4385**	.6096**	.3698**	.4454**
READ94	.5322**	.8150**	.4723**	.5011**	.7677**	.4722**
READ95	.3788**	.5125**	.8585**	.2600**	.4386**	.7952**
WRIT93	.6962**	.4007**	.3805**	.5908**	.3694**	.3417**
WRIT94	.4478**	.7007**	.4366**	.4138**	.5759**	.4315**
WRIT95	.4494**	.5251**	.7637**	.2944**	.3793**	.6882**
SOCS93	.8642**	.5095**	.4659**	.6073**	.4400**	.4574**
SOCS94	.4901**	.8713**	.5419**	.4997**	.7318**	.5769**
SOCS95	.4180**	.4821**	.9118**	.2962**	.4486**	.9038**
SCIN93	1.0000	.5339**	.4690**	.7397**	.4582**	.4158**
SCIN94	.5339**	1.0000	.5492**	.5088**	.8050**	.5772**
SCIN95	.4690**	.5492**	1.0000	.3146**	.4974**	.8862**
MATH93	.7397**	.5088**	.3146**	1.0000	.4630**	.3483**
MATH94	.4582**	.8050**	.4974**	.4630**	1.0000	.5301**
MATH95	.4158**	.5772**	.8862**	.3483**	.5301**	1.0000

Table 8. Intercorrelations of Sums of School Residuals Across Verbal MSPAP Content Scores (Language + Reading + Writing + Social Studies), Quantitative MSPAP Content Scores (Science + Math), and Combined MSPAP Content Scores (Verbal + Quantitative)

Variable	Cases	Mean	Std Dev
VERB93	605	-.0159	.8064
VERB94	591	-.0352	.7544
VERB95	600	-.0035	.8683
QUAN93	644	-.1694	1.2163
QUAN94	646	-.0968	1.0750
QUAN95	622	-.0913	1.0542
SEL93	605	-.0497	.8000
SEL94	591	-.0685	.7630
SEL95	598	-.0174	.8404

- - Correlation Coefficients - -

	VERB93	VERB94	VERB95	QUAN93	QUAN94	QUAN95
VERB93	1.0000	.6652**	.5637**	.8526**	.5071**	.4773**
VERB94	.6652**	1.0000	.6231**	.6025**	.8628**	.5629**
VERB95	.5637**	.6231**	1.0000	.4177**	.5409**	.8771**
QUAN93	.8526**	.6025**	.4177**	1.0000	.5504**	.4079**
QUAN94	.5071**	.8628**	.5409**	.5504**	1.0000	.5885**
QUAN95	.4773**	.5629**	.8771**	.4079**	.5885**	1.0000
SEL93	.9818**	.6760**	.5598**	.9363**	.5484**	.4958**
SEL94	.6576**	.9820**	.6205**	.6365**	.9428**	.6019**
SEL95	.5664**	.6264**	.9847**	.4475**	.5795**	.9473**

	SEL93	SEL94	SEL95
VERB93	.9818**	.6576**	.5664**
VERB94	.6760**	.9820**	.6264**
VERB95	.5598**	.6205**	.9847**
QUAN93	.9363**	.6365**	.4475**
QUAN94	.5484**	.9428**	.5795**
QUAN95	.4958**	.6019**	.9473**
SEL93	1.0000	.6827**	.5735**
SEL94	.6827**	1.0000	.6385**
SEL95	.5735**	.6385**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed

Last two characters in variable name are year.

Appendix B

Comparison of the Combined MSPAP Content Score Residuals with the MSDE School Performance Index and Its Residuals

While the Maryland School Performance Assessment Program is usually called "high stakes" for schools, decisions are actually reached by the Maryland State Department of Education (MSDE) on the basis of the School Performance Index. The MSDE School Performance Index (SPI) for an elementary school is the average of 13 ratios, each of which is the observed percentage of a variable at a school divided by the targeted percentage for school performance to be satisfactory for that variable. The thirteen variables and targeted percents are:

Attendance Rate	94
Grade 3 MSPAP Percent Satisfactory in Reading	70
Grade 3 MSPAP Percent Satisfactory in Writing	70
Grade 3 MSPAP Percent Satisfactory in Language Usage	70
Grade 3 MSPAP Percent Satisfactory in Mathematics	70
Grade 3 MSPAP Percent Satisfactory in Science	70
Grade 3 MSPAP Percent Satisfactory in Social Studies	70
Grade 5 MSPAP Percent Satisfactory in Reading	70
Grade 5 MSPAP Percent Satisfactory in Writing	70
Grade 5 MSPAP Percent Satisfactory in Language Usage	70
Grade 5 MSPAP Percent Satisfactory in Mathematics	70
Grade 5 MSPAP Percent Satisfactory in Science	70
Grade 5 MSPAP Percent Satisfactory in Social Studies	70

In order to study the SPI in relation to the combined MSPAP content area score residuals, the SPI was calculated for each school for each year, 1993, 1994, and 1995. Residual variation in the SPI was studied by predicting it using the same predictors employed in the content area predictions earlier (percents accounted for on all the content areas for both grades were treated as predictors since the SPI includes all content areas; not surprisingly, several were not possible to enter in each regression since they were linearly related perfectly with others that were entered).

Because attendance rate was a predictor in the earlier content area predictions but is also a factor in the SPI, predictions were made with and without attendance rate in the predictor set. This resulted in six variables, RESSPI93, RESSPI94, and RESSPI95 are the studentized residuals from the regressions calculated without attendance rate and RESSCI93, RESSCI94, and RESSCI95 are the studentized residuals calculated with attendance rate in the predictor set.

The multiple R squares for these six regressions were:

	Attendance Rate	
Year	With	Without
1993	.721	.719
1994	.732	.732
1995	.717	.716

The small differences between the R squares with and without attendance rate as a predictor suggests that results from the MSPAP test scores are the dominant determiners of variation in the SPI.

The table below contains means, standard deviations, and correlations of the SPI and the studentized residuals of both it and the overall selection index developed on the basis of combining residuals of MSPAP means. The raw SPI correlates about .9 across years. That these correlations are stronger than the intercorrelations of the other variables, suggests that the SPI is sensitive to variables that were used as controls in the regressions. The strong within-year R squares between the controls and the SPI are corroborating evidence.

The differences between the SPI-based residuals and the combined residualized MSPAP content scores are of interest. There are two fundamental methodological differences between these sets of residuals. First, the SPI is calculated from proportions above fixed cut-off points on the MSPAP content area scales, while MSPAP content area means were used to arrive at residualized content scores. Since the cut-off points are in relatively dense regions of the scales (about .6 standard deviations above the mean on the 1991 norming sample), the means and the proportions may be more interchangeable currently than in the future if average performance drifts appreciably in either direction.

The second methodological difference has to do with the weighting used in the regressions when predicting school means on the content area scores. Each school received a weight that was the inverse of the estimated sampling variance of its mean. However, no weight was used in regressions predicting the SPI since its standard error is a far more complicated statistic.

The correlations suggest that residuals based on the SPI are relatively interchangeable with combined residuals based on content area means in any one year, all being about .9 whether or not attendance rate is in the predictor set. The most stable across years were residuals based on SPI predicted without attendance rate as a predictor (average intercorrelation of RESSPI = .68), the next most stable were residuals based on SPI predicted with attendance rate as a predictor (average intercorrelations of RESSCI = .67), and the least stable were average content area residual (average intercorrelation of SEL = .63), but these are not very different.

Means, Standard Deviations, and Intercorrelations of the School Performance Index (SPI), Residualized SPI Without Attendance as a Predictor (RESSPI), Residualized SPI With Attendance as a Predictor (RESSCI), and Combined Residualized MSPAP Content Scores Across Years.

Variable	Cases	Mean	Std Dev
SPI93	734	.4800	.2092
SPI94	734	.5222	.2184
SPI95	734	.5821	.2308
RESSPI93	731	.0009	1.0023
RESSPI94	730	.0011	1.0020
RESSPI95	728	.0007	1.0014
RESSCI93	731	.0009	1.0020
RESSCI94	730	.0012	1.0020
RESSCI95	728	.0007	1.0016
SEL93	605	-.0497	.8000
SEL94	591	-.0685	.7630
SEL95	598	-.0174	.8404

- - Correlation Coefficients - -

	SPI93	SPI94	SPI95	RESSPI93	RESSPI94	RESSPI95
SPI93	1.0000	.9193**	.8976**	.5275**	.3691**	.3435**
SPI94	.9193**	1.0000	.9100**	.3927**	.5158**	.3539**
SPI95	.8976**	.9100**	1.0000	.3793**	.3802**	.5316**
RESSPI93	.5275**	.3927**	.3793**	1.0000	.7020**	.6364**
RESSPI94	.3691**	.5158**	.3802**	.7020**	1.0000	.6834**
RESSPI95	.3435**	.3539**	.5316**	.6364**	.6834**	1.0000
RESSCI93	.5262**	.3930**	.3790**	.9975**	.7028**	.6371**
RESSCI94	.3690**	.5156**	.3798**	.7016**	.9998**	.6831**
RESSCI95	.3421**	.3526**	.5308**	.6326**	.6800**	.9991**
SEL930	.4699**	.3588**	.3341**	.8886**	.6619**	.5936**
SEL940	.3461**	.4742**	.3551**	.6271**	.9028**	.6321**
SEL950	.2471**	.2668**	.4356**	.5426**	.6086**	.9104**

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)
" . " is printed if a coefficient cannot be computed

	RESSCI93	RESSCI94	RESSCI95	SEL93	SEL94	SEL95
SPI93	.5262**	.3690**	.3421**	.4699**	.3461**	.2471**
SPI94	.3930**	.5156**	.3526**	.3588**	.4742**	.2668**
SPI95	.3790**	.3798**	.5308**	.3341**	.3551**	.4356**
RESSPI93	.9975**	.7016**	.6326**	.8886**	.6271**	.5426**
RESSPI94	.7028**	.9998**	.6800**	.6619**	.9028**	.6086**
RESSPI95	.6371**	.6831**	.9991**	.5936**	.6321**	.9104**
RESSCI93	1.0000	.7021**	.6339**	.8904**	.6283**	.5423**
RESSCI94	.7021**	1.0000	.6795**	.6609**	.9026**	.6083**
RESSCI95	.6339**	.6795**	1.0000	.5913**	.6290**	.9104**
SEL93	.8904**	.6609**	.5913**	1.0000	.6827**	.5735**
SEL94	.6283**	.9026**	.6290**	.6827**	1.0000	.6385**
SEL95	.5423**	.6083**	.9104**	.5735**	.6385**	1.0000

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

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